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ABSTRACT

Groupwork carried out via computer mediated communication (CMC) is now a fact of life in the the workplace. This study investigates the effects of group membership and task experience on asynchronous computer-mediated groupwork. Groups acquiring task experience as groups during weeks one and two performed better on the final task at week three compared to groups in other treatment conditions. On measures of group process and group member reactions, participants acquiring group and task experience spent less time on the group task and expressed more satisfaction with, and confidence in, the final task solution. Implications for the workplace are that practice of computer mediated group tasks in stable groups is advisable. Training and work environments that expose work groups to computer-mediated tasks and provide opportunity and time to work on complex problems, would improve group performance. Subsequent training would focus on facilitating the transfer of skills and knowledge to new contexts. (Contains 24 references.) (Author)

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Group and Task Experience: Implications for Computer-Mediated Groupwork in the Workplace

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Abstract: Groupwork carried out via CMC are now a fact of life in the work place. This study investigates the effects of group membership and task experience on asynchronous computer-mediated groupwork. Groups acquiring task experience as groups during weeks 1 and 2 performed better on the final task at week 3 compared to groups in other treatment conditions. On measures of group process and group member reactions, participants acquiring group and task experience spent less time on the group task and expressed more satisfaction with, and confidence in, the final task solution. Implications for the workplace are that practice of computer mediated group tasks in stable groups is advisable. Training and work environments that expose work groups to computer-mediated tasks and provide opportunity and time to work on complex problems, would improve group performance. Subsequent training would focus on facilitating the transfer of skills and knowledge to new contexts.

Introduction

The prevalence of computer-mediated groupwork in organizations is such that group tasks carried out via CMC are now a "fact of life" in the work place. Two factors are identified in the literature as possible mediating factors in computer-mediated group performance, competencies and social experiences: Group membership stability and task experience. Groupwork research suggests that increased experience of a group as a group and increased experience of the group with a task both tend to improve the efficiency of the groupwork and overall quality of the work produced (Cannon-Bowers, Tannenbaum, Salas & Volpe, 1995; Hollingshead, 1998a and 1998b; Littlepage, Robison, Reddington, 1997; McIntyre & Salas, 1995; Wittembaum & Stassser, 1995). Such effects, however, have not yet been empirically studied in an asynchronous computer-mediated groupwork context nor systematically examined over a prolonged period of observation (McGrath, 1993). Therefore, this study investigates the effects of membership continuity and task experience on asynchronous computer-mediated groupwork. The group membership factor represents the two conditions under which groups may perform: Stable (unchanging) group membership and changing group membership. The task experience factor is determined by whether or not groups engage in task practice prior to the assessment of group performance.

Effects of group and task experience on computer-mediated groupwork

Group performance

Group members that acquire experience with each other and with a particular task benefit from the knowledge and skills gained, specific to both the task and the team (Cannon-Bowers, Tannenbaum, Salas, & Volpe 1995; Salas & Cannon-Bowers, 1997). As both individual- and group-level competencies develop, group processes are facilitated thereby resulting in better group performance. Recent research in the areas

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of team training (Cannon-Bowers, et al., 1995; Cannon-Bowers & Salas 1997; Cannon-Bowers, Salas, Blickensderfer & Bowers, 1998) and group practice (Hollingshead, 1998a; Hollingshead, 1998b; Salas & Cannon-Bowers, 1997; Littlepage et al., 1997; Moreland & Wingert, 1995) consistently shows that groups acquiring task-related experience as stable groups perform better than those whose members do not acquire this type of experience. The implication for the present research is that in order to effectively carry out a computer-mediated task requiring a high level of interdependence (i.e., a judgment task), groups acquiring task experience as stable groups will perform better. Taking the aforementioned into consideration, the following hypothesis regarding group performance is tested. *Hypothesis 1*: Groups acquiring judgment task experience as stable groups will perform better on the final judgment problem than groups in any other treatment condition.

Group process –time on task

Group process and interaction, consisting of communication and coordination skill dimensions, are required behaviours for effective task execution (Cannon-Bowers et al., 1995). Provided that the group membership, task type and groupwork context remain constant, the increase in experience that occurs over time allows the group to progressively re-adapt the group-task-context fit to take advantage of the increased predictability, reduced ambiguity and reduced coordination (Cannon-Bowers, et al. 1995; McGrath & Hollingshead, 1994; Hollingshead, McGrath & O'Connor, 1993; McGrath, Arrow, Gruenfeld, Hollingshead & O'Connor, 1993). As group norms of communication and task performance become established over time, group members require lesser amounts of time to complete the task effectively. Based on the aforementioned rationale, the following prediction is made. *Hypothesis 2*: Regarding time on task, individuals who did not acquire group or task-related experience will spend more time on the final judgment task.

Satisfaction with process

Recent research carried out by Benbunan-Fich and Hiltz (1999), Galegher and Kraut (1994), Straus and McGrath (1994), Warkentin, Sayeed and Hightower (1997), and Wilson, Morrison and Napier (1997), among others, affirms that groups carrying out collaborative work via CMC systems tend to be less satisfied with group process than their face-to-face counterparts. In short, results from comparative studies that don't extend beyond one data collection session suggest that computer-mediated groups must work harder to accomplish the same results as face-to-face groups (Galegher & Kraut, 1994). However, if group members given ample time to familiarize themselves and acquire experience with the communication technology, fellow group members, the task, and the groupwork context, previous findings about satisfaction may not entirely hold true. There is evidence that even minimal experience with group members and task work alters group process and performance (Burke & Chidambaram, 1999; Hollingshead, 1998a, 1998b; Littlepage et al., 1997; McGrath, Arrow, Gruenfeld, Hollingshead & O'Connor, 1993; Liang, Moreland & Argote, 1995; Moreland, Argote, & Krishnan, 1996). If these changes to group process and performance are of a facilitating nature, then it is reasonable to assume that member satisfaction regarding group process would also be positively affected by membership and task experience. Based on this reasoning, the following hypothesis about group member satisfaction with the computer-mediated group process is tested. *Hypothesis 3*: Regarding the final judgment task, individuals working in groups that acquired judgment task experience as stable groups will express higher levels of satisfaction with group process

Satisfaction with, and confidence in, group solution

If group members are satisfied with the computer-mediated group process of carrying out a group judgment task, it is reasonable to expect that group member satisfaction with the task solution will parallel this result. *Hypothesis 4*: With respect to the final judgment task, individuals working in groups that acquired judgment task experience as stable groups will express higher levels of satisfaction with the task solution.

Similarly, if group members are satisfied with the group task solution, it is reasonable to expect that confidence in the group solution will parallel this result. *Hypothesis 5*: Individuals acquiring judgment task experience as members of groups with stable membership will express higher levels of confidence that their group solution of the final judgment task is correct.

Method

Subjects and Groupwork Context

One hundred and sixty eight undergraduate students enrolled in Contemporary Business Thinking at Concordia University participated in this three-week study. Four treatment conditions were constructed using FirstClass whereby group membership and task experience conditions were created by varying participants' experiences during weeks 1 and 2, prior to the performance of the criterion judgment task at week 3. Groupwork took the form of asynchronous computer-mediated communication between group members in protected (group members only) conference areas. During weeks 1 and 2 of the study, subjects in the related task experience condition performed judgment tasks similar to week 3's task involving aesthetic or evaluative judgments for which there is no correct answer (McGrath, 1984; Wittenbaum & Stasser, 1996). Subjects in an unrelated task experience condition performed idea generation tasks during weeks 1 and 2. At week 3, all groups (i.e., all treatment conditions) performed the same judgment task (see Table 1 below).

Treatment conditions	Weeks		
	1	2	3
Stable membership with task experience	J_1	J_2	J_3
Stable membership without task experience	IG_1	IG_2	J_3
Changing membership with task experience	J_1	J_2	J_3
Changing membership without task experience	IG_1	IG_2	J_3

IG = Idea generation task
J = Judgment task

Table 1: Order of Task Assignment

Variables

Group membership consisted of two conditions—stable or changing. Similarly, task experience was operalitioned by two conditions—task experience and non-related task experience.

Group performance was measured by group solutions to the final judgment task, scored according to Straus' 1992 task scoring system of weighted values. Group process –time on task was measured with a single post-treatment item. Group members' social experiences were assessed with post-treatment questionnaire items inquiring about subjects' degree of satisfaction with the group process, group solution, as well as level of confidence in the group solution.

Experimental Procedure

Upon completion of a two-week FirstClass training and practice period, the three-week computer-mediated groupwork study began. Subjects were assigned randomly to conditions and to 3-person groups. Groups in the stable membership condition remained intact throughout the entire study (i.e., the same three people worked together). In contrast, groups in the changing membership condition were re-assigned to new 3-person groups at the start of every new week of the study such that no person worked with the same people more than once. At the start of Week 1, each subject was e-mailed his or her task with instructions on how to complete and submit it. Participants had two days to complete the task individually and submit a

solution to the *Individual Submissions* conference area. Subjects then had the balance of the week to carry out the same task with their group. Upon completion of the group task, group solutions were submitted to a specified conference area, called *Group Submissions*, and each group member individually completed and submitted an online Week 1 Post-Task Questionnaire. During Weeks 2 and 3, subjects adhered to the same process described in Week 1 above, with subjects in the changing membership treatment condition being re-assigned to new 3-person groups. Upon submission of the final group solution at Week 3, subjects completed and submitted an online Post-Treatment Questionnaire and were given written debriefing of the study, via a personal e-mail message.

Results

A 2x2 between-subjects factorial design investigated the effects of group membership and task experience on group performance, group process and group members' social experiences. A total of 168 students participated in this research, forming a total of 56 three-person groups, 14 groups assigned to each treatment condition. The study was carried out over a period of three weeks with all four treatment groups (n=56) performing the same final judgment (criterion) task at week 3. Group performance was averaged across members in a group and assessed at the group level (n=56). All other dependent variables were based on data collected from the post-treatment questionnaire and were analyzed at the individual level (n=168). Analyses of all dependent measures were carried out via two-way analyses of variance (ANOVA) and a Pearson's correlation. In order to control for experimentwise type I error, the significance level for all F-tests was set at $p = .01$.

Group performance

Treatment mean scores for performance of the final judgment task (Task 3) reveal that groups acquiring judgment task experience as stable groups received higher task scores compared to groups in any of the other three treatment conditions (see Table 2).

Treatment	Mean	SD	N
Stable membership with task experience (SM/EXP)	7839.71	624.89	14
Stable membership without task experience (SM/NO EXP)	6721.36	1209.51	14
Changing membership with task experience (CM/EXP)	4823.57	1493.90	14
Changing membership without task experience (CM/NO EXP)	3230.00	1087.92	14
TOTAL	5653.66	2102.99	56

Table 2: Measures of central tendency for final task scores

A two-way ANOVA was carried out to confirm significant differences between these treatment means. As predicted, results show a main effect for membership ($M = 7280.53$, $M_{Changing} = 4026.78$), $F(1, 52) = 112.55$, $p < .01$ as well as a main effect for task experience ($M_{Experience} = 6331.64$, $M_{No\ Experience} = 4975.68$), $F(1,52) = 19.54$, $p < .01$. These results support Hypothesis 1.

Group process—time on task

Hypothesis 2 predicted that individuals who did not acquire group or task-related experience during weeks 1 and 2 would spend more time on the final judgment task. To test this hypothesis, subjects replied to the question "How much time did *you* spend on this assignment (in hours)?". A two-way ANOVA indicates a main effect for membership ($M = 2.66$, $M_{Changing} = 3.11$), $F(1,164) = 7.90$, $p < .01$, as well as a main effect for task experience ($M_{Experience} = 2.67$, $M_{No\ Experience} = 3.10$), $F(1,164) = 7.09$, $p < .01$. These results support Hypothesis 2.

Satisfaction with process

Post-treatment questionnaire item 22 "I felt pressured trying to complete the task in the allotted time" and item 23 "I felt our group needed more time to do a good job on this group task" were combined to yield a composite score of subjects' satisfaction with the process of carrying out the final judgment task. The coefficient alpha for the composite, calculated at the group member level, was .84. A two-way ANOVA showed a main effect for membership, with subjects assigned to groups with changing membership reporting higher levels of pressure to complete the task within the allotted time ($M_{Changing} = 4.13$, $M = 3.64$), $F(1,164) = 12.10$, $p < .01$. Unexpectedly, there was no main effect for task experience ($M_{Experience} = 3.77$, $M_{No\ Experience} = 4.00$), $F(1,164) = 2.60$, $p > .01$. Hypothesis 3 is partially supported.

Satisfaction with, and confidence in, group solution

Satisfaction with the group solution for the final judgment task was assessed with responses to item 21 of the post-treatment questionnaire "I am satisfied with the solutions my group came up with". Results of a two-way ANOVA showed a main effect for membership ($M = 3.90$, $M_{Changing} = 3.51$), $F(1,164) = 13.49$, $p < .01$ and a main effect for task experience ($M_{Experience} = 3.99$, $M_{No\ Experience} = 3.43$), $F(1,164) = 27.37$, $p < .01$. This results support Hypothesis 4.

Participants acquiring judgment task experience as members of groups with stable membership expressed higher levels of confidence in their group solution of the final task than individuals in any of the other three treatment conditions. An ANOVA on subjects' responses to item 19 "I am confident that the solutions our group came up with are correct" confirmed a main effect for membership ($M = 3.74$, $M_{Changing} = 3.27$), $F(1,164) = 20.10$, $p < .01$ and task experience ($M_{Experience} = 3.74$, $M_{No\ Experience} = 3.27$), $F(1,164) = 20.10$, $p < .01$. Hypothesis 5 is therefore supported.

Discussion and Implications for the Workplace

Results indicated that the more group members practice together as a group, the better they perform as a group on an asynchronous computer-mediated judgment task. The fact that groups acquiring judgment task experience in stable groups during weeks 1 and 2 scored substantially higher on the final task at week 3, compared to those who had not acquired these same types of experience, provides compelling evidence of the importance that gaining experience with a task as a stable group has on group performance.

Participants who became experienced with their group while carrying out judgment tasks reported spending less time on the final task. This suggests that subjects' accumulation of experience with computer-mediated judgment tasks as members of stable groups lead to a routinization of performance, thereby reducing of the amount of time required to carry out the final judgment task (McGrath, Arrow, Gurenfeld, Hollingshead & O'Connor, 1993). As group norms of communication and task execution became established over time, group members required lesser amounts of time to complete the final task effectively.

Reports of satisfaction with the process of carrying the task via asynchronous computer-mediated communication indicate that stable group membership positively affected subjects' level of satisfaction on this measure. Subjects assigned to groups with changing membership, regardless of whether or not they acquired judgment task experience, expressed lower levels of satisfaction with the process of completing the task. These participants, who, due to the lack of group familiarity, were not as adept at completing the judgment task, and generated the lowest group scores on the final task.

Group membership and task experience generated positive influences on subjects' levels of satisfaction with, and confidence in, the task solution. Significant correlations between these two measures and final task scores, $r = .79$, $p < .01$, provide further evidence that the computer-mediated group performance of tasks involving high levels of cooperation and conflict resolution is positively affected by group members' prior experience with the task and the group.

Computer-mediated groupwork in organizations is typically carried out among the same people, over a prolonged period of time and requires sustained interaction (Burke & Chidambaram, 1999). In this

study, membership continuity positively affected group performance, time on task, and social reactions towards the group task. The implication for computer-mediated groupwork in organizations is that practice of tasks in stable groups would be an effective training method when the same group of people are going to be performing similar tasks in their jobs. Training and work environments that expose work groups to the general principles and procedures underlying computer-mediated tasks, that present them with a variety of relevant examples and give them the opportunity and time to work on several similar problems would likely lead to improved group performance.

To ensure that training does not compartmentalize people, skills and knowledge into specific task or group activities, this type of training should be used as a facilitative measure. Workers would first acquire job-relevant computer-mediated groupwork skills in stable groups so that much of the work required to carry out the assigned task is facilitated by group and task experience. Subsequent training would extend beyond the familiar groupwork context, incorporating new tasks and altering group membership so that knowledge and skills are further developed. The objective is to design training and job environments that facilitate the transfer of skills and knowledge to new contexts (e.g., new tasks, new people, new CMC systems) so that workers can easily adapt to a variety of computer-mediated groupwork situations.

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